danger. Action and tangible results that appeal to men so strongly are often at odds with reflection and spiritual values. The ideal university must not forget that material efficiency is only a means to ends—a finer type of personality, a more just and ennobling social order. The university aims at training, not skilled exploiters, but men and women who shall first of all be high-minded citizens with a loyal "sense of the state," who shall exemplify the scientific spirit, bear themselves gallantly in life's struggles, show themselves possessed of satisfying mental resources, and prove faithful to the highest standards.

Men and women of this sort do not issue from a place given over wholly to utility and material interests. There must be a controlling, pervasive spirit of service, a desire for "a harmonious expansion for *all* the powers which make the beauty and worth of human nature," and a real appreciation of life's deeper meaning. The university must help men to answer Kant's three questions, the questions of science, of morality, and of religion: "What can I do? What ought I to do? What may I hope for?" True, the state university can have no official theology and no ecclesiastical affiliations. But it may have a spirit of reverence for the mysteries of life; it may cultivate that essential religion which exalts the things of the human mind and spirit over things physical and which reads back of the material world a purpose and a destiny. "The state," said Arnold, "is of the religion of all of its citizens, without the fanaticism of any of them." Bacon's "College of the Seven Days Works" was a research institution, but it did not forget that it was concerned with only certain aspects of a vast university. "We have," said one of the staff, "hymns and services of laud and thanks to God for His marvelous works, and forms of prayer imploring His aid and blessing for the illumination of our labors and the turning of them unto good and holy uses."

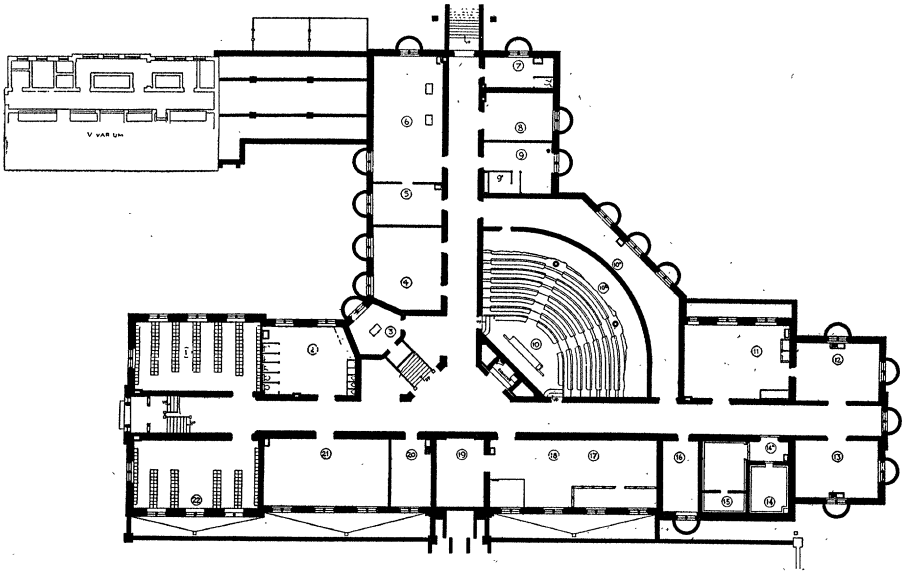
We have caught glimpses of the university ideal. May this, as the years pass, grow ever clearer, nobler, more inspiring. May it take our "imaginations by storm" not as an evanescent emotion, but as a persistent vision. We remember Toynbee's words, "a definite intelligible plan for carrying that ideal out into practise." It is to the many details of this plan that as colleagues we are to address ourselves. May we take up this great task with a solemn sense of what it means. We must not deceive ourselves. We advance to no easy triumphs. We must cherish no millenial dreams. We must have faith that good-will guided by wisdom will in the end bring our vision to pass. Let us then with sober judgment and steady courage pledge anew our loyalty to the ideals of the university, to the people of the state and to that republic of science, letters and the arts which knows no national boundaries. May each of us take to heart the counsel of Goethe:

> What each day needs, that shalt thou ask;
> Each day will set its proper task.
> Give others' work just share of praise;
> Not of thine own the merits raise;
> Beware no fellow man thou hate;
> And so in God's hands leave thy fate.

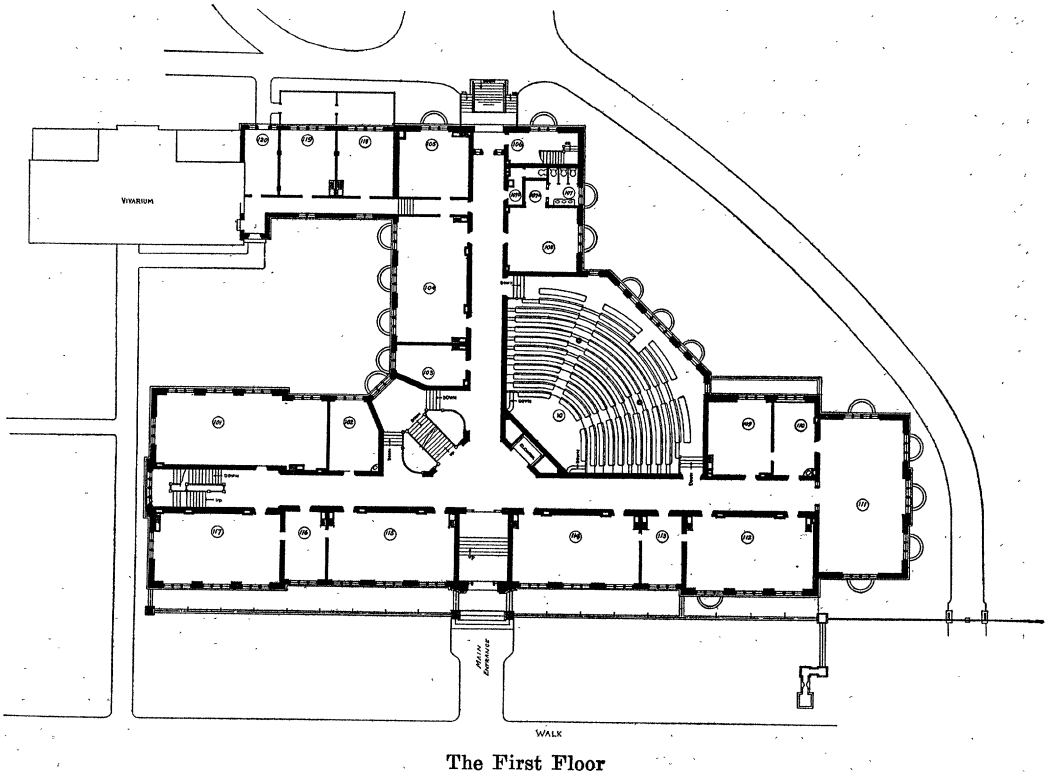
George E. Vincent

THE NEW ZOOLOGICAL LABORATORY OF THE UNIVERSITY OF PENNSYLVANIA

In devising and planning this laboratory to fill the needs for many years to come of zoological study at the University of Pennsylvania, zoology has been construed in its broadest sense, as the science of animal life. All, therefore, it was considered, should be included that would allow of the prosecution of study in any branch of this great and most important subject; and this object we have



Basement



The First Floor

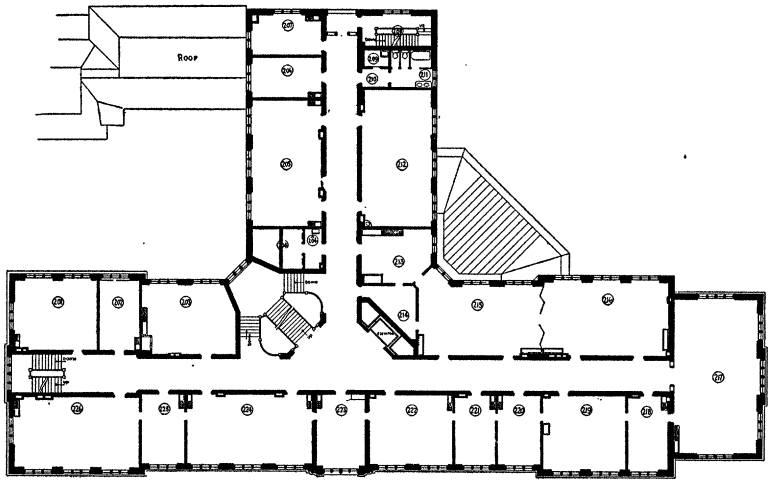
tried to fulfill, so far as we understand present needs and could foresee future ones. Great praise is due to the architects, Messrs. Cope and Stewardson, for aiming at utility first, and for meeting as closely as possible the requirements planned by the staff.

The building comprises a full basement, with three stories above it, and is thoroughly fire-proof. The general form is that of a T, the longest wing facing north with a length of 216 feet. The shorter south wing connects at the east with the vivarium building that was erected in 1900. This gives a minimal amount of hall space and all corridors, even those of the basement, are amply lighted by windows at their ends and by glass interior doors. The main entrance is in the center of the north façade, and close to this main entrance is the main stairway. There is a second entrance and stairway at the east end of the main wing, a special freight entrance to the basement at the south end, and near the last an exterior fire escape. The type of architecture is early English Renaissance; the walls are of sand-moulded red brick, in a variety of shades, laid Flemish bond. Base courses, cornices and window-sill levels are of gray Indiana limestone; the corners of the building are built of this stone, and doorways and windows framed with it. All windows are exceptionally large and extend nearly to the ceilings; those on the north front have in each sash two panes of glass separated by a half-inch air space, so as to reduce the cost of heating.

Above the third-story windows of the east end of the main wing are inscribed the names of Cope and Leidy, the great naturalists of Philadelphia; and on its north face the names of Lamarck, Darwin, Huxley, Claude Bernard, Johannes Mueller, Harvey, Aristotle, Malpighi, Von Baer, Schwann, Réaumur, Cuvier, Linnæus and Ray.

All floorings are cement; this is covered with terrazza in the corridors, with linoleum in the library and lecture rooms, and with maple in all private rooms and laboratories—the cement being left in the breeding and preparation rooms. Maple flooring is more durable than linoleum, does not splinter, and with age grows continuously harder.

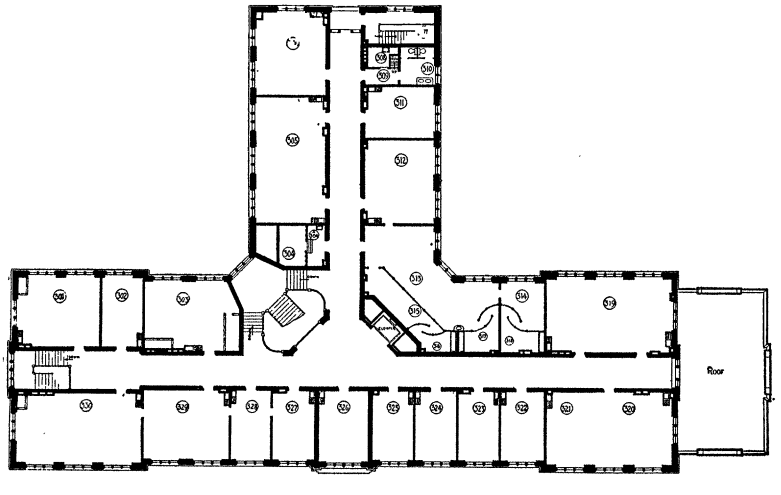
The unit system of construction of rooms has been fairly rigidly followed. Rooms are only 20 feet deep. The largest laboratories, each intended for 24 students, the largest number a demonstrator can direct, measure 20×36 feet, and have three windows; a few smaller laboratories, each intended for 16 students, measure each 20×24 feet and have two windows; the private rooms for investigators range from 20×11 feet to 20×14 feet and have each one window. Each private room is then one third the size of a large laboratory unit. It was considered wisest to keep all private rooms of these dimensions rather than to build larger ones, so as to fully accommodate a considerable number of investigators. The only exception is a large private room (No. 301) for physiology, 20×24 feet. These private rooms for the staff and investigators are situated mostly on the north; there are two of them (Nos. 113, 116) on the first floor, six (Nos. 207, 218, 220, 221, 223, 225) on the second and seven (Nos. 301, 322–328) on the third floor, a total of fifteen. Each of these rooms has a window table two feet wide extending the whole width of the room, supported rigidly on iron brackets fitting into the wall; and a sink in one corner next the hallway. In addition there is a larger room (No. 320) on the third floor to accommodate several workers at once, with a continuous window table on two sides. In each full-sized laboratory there are three working tables, each 4×13 feet, accommodating eight students and placed at right angles to the windows—an arrangement that prevents the demonstrator from interfering with the light of any student; in each table are drawers, and lockers each large enough for a compound and a dissecting microscope and dissecting trays. The inner side of each locker door has two shelves for bottles, and each microscope and its parts bear the same number as the locker. Each student receives a table area of two feet by three and a quarter, one locker and two drawers. In certain laboratories, as those for histology and cytology, these tables contain



Second Floor Plan

gas and electric outlets, and those for physiology and protozoology contain also sinks. The only exception from this general type of large laboratory table are certain special ones for anatomy which are made considerably higher and in smaller units suitable for individual students. Every laboratory has a slate blackboard, 3×12 feet, directly facing the windows, and a sink in each corner of the hallway.

There are two lecture rooms. The large auditorium (No. 10) is reached by the students from the first floor, by the speaker from the basement, and has almost the height of the basement and first floor; it is placed at the junction of the main with the south wing,



Third Floor Plan

utilizing a space not well adapted for other purposes. This has 327 seats without writing arms, with only a moderate rise in their tiers, and four aisles; beneath the large skylight is a system of vertical shutters that may be turned horizontal, so as to exclude the light, by the revolution of a wheel placed beneath the blackboard. The smooth plaster wall above the blackboard furnishes a lantern screen, 11×11 feet. A small lecture room (No. 212) is placed on the second floor, to accommodate sixty students, with separate chairs fitted with writing arms. But lectures may be given in any laboratory room, for all have blackboards.

Nearly opposite the smaller lecture room is a room for charts (No. 206); this contains a metal rack on which Leuckart and Deyrolle charts are hung vertically by hooks.

The library (No. 111) is at the west end of the first floor, and measures 24×44 feet. It is fitted with five double-range metal stacks, and a folio stack; one end of it is a reading space. Adjoining it is a librarian's room (No. 110). The library is to be entered from the librarian's room, so as to prevent ingress of dust from the hallway.

No large museum rooms were planned, only a synoptical museum and rooms for the storage of anatomical collections. It was not thought wise to duplicate in any way the exhibition collections of the museums of Philadelphia, but to make the building strictly a working laboratory.

For the elementary courses in general zoology, four laboratories are provided on the first floor, accommodating ninety-six students at one time. The laboratories for general zoology (Nos. 104, 114, 115, 117) and the auditorium (No. 111) and synoptical museum (No. 101) which are auxiliary to this course, are all placed on the first floor so as to segregate the majority of the students there, and to avoid noise on the stairways. Only as the students proceed to more advanced courses will they pass to the other floors, and thereby ascend the heights of learning. It was not thought necessary to provide any special preparation rooms for the course in general zoology, because each laboratory has its own sinks and preparation tables, besides a demonstration table on castors that may be readily moved from one room into another; there are no sills beneath the doors.

On the first floor, also, is a laboratory for entomology (No. 112), and opposite it one (109) for advanced work on this subject.

For vertebrate anatomy there are two laboratories (Nos. 215, 216) for elementary courses on the second floor, each with two large sinks; these are separated by a sliding accordion partition, so that they may be thrown into one when necessary. Adjoining these is a small room (No. 214) for charts and models and a preparator's room (No. 213); the latter has a chemical hood and a very large sink. Contiguous is also a storage museum (No. 217) with a large wall case for larger mounted skeletons, and a series of vertical cases provided with interchangeable trays and drawers and with lift-off wooden doors fitting almost dust-proof; the latter cases are for alcoholic and other specimens. Another part of the anatomical equipment are two storage rooms (Nos. 12, 13) in the basement for rough collections, and a special preparation room (No. 11) communicating with these; the latter has a specially designed hood for maceration and boiling of skeletons, a large slate table with running water, a heating and drying table, a sink large enough to contain the body of a horse, and an overhead trolley track for the carriage of large objects.

For elementary work in histology and embryology there are two laboratories (Nos. 205, 224) on the second floor. For more advanced courses, especially in cytology and embryology there are two smaller laboratories (Nos. 222, 219) on the same floor, one of these being fitted with an aquarium table.

For protozoology there is one laboratory (No. 226) for elementary work, and opposite it a culture room (No. 201) with southeast exposure provided with an aquarium table.

All these courses demanding much microscopical work are close together and convenient to the special room (No. 202) for paraffine baths and sterilizers, and to the reagent room (No. 203), which has a chemical hood

and is for the housing of all general glassware and reagents.

On the third floor at the east end is the section for physiology. This comprises a large private room (No. 301) with a hood, rigid table for a motor and chemical table; a laboratory (No. 330) for elementary work, with a hood; a glassware and apparatus room (No. 302); a room (No. 329) for motors; and a biochemical laboratory (No. 303) completely outfitted with a large hood and two chemical tables, and enclosing a balance room partitioned off by glass. For the most precise weighing there is a small room (No. 3) in the basement with a built-in pier. A laboratory (No. 319) for animal behavior is placed on the third floor. For the use of both these subjects there are two rooms painted dull black for experiments on reactions to light; one (No. 313) of these is on the third floor, intended especially for the study of the effects of sunlight, and the second (No. 6) considerably larger, is in the basement and provided with built-in piers for the placing of delicate physical apparatus, and with an anteroom (No. 5) for light generators.

Of other general equipment the following may be briefly described:

For photography there is a dark room (No. 9) in the basement for the special use of students. The main space for this purpose, however, is a large room (No. 313) on the third floor, with a skylight over a portion of it, communicating with which are three dark rooms (Nos. 315, 316, 317), one of them especially large for work with the ultra-violet apparatus; and adjoining is a room (No. 314) for microphotography, also with a dark room (No. 318).

In the basement is a machine shop (No. 21) well equipped with metal- and wood-working machinery (lathes and drill presses) for the repair and making of apparatus.

For breeding and other experimental work there are considerable facilities. Within the new building are no aquaria provided beyond special aquarium tables in two rooms. The old vivarium is now devoted almost entirely to aquaria, is well equipped with tanks and pools for fresh water, and with a smaller section for salt water; two new shallow floor pools have been added to it. The wing connecting the vivarium with the new laboratory consists of a keeper's room (No. 120) and of two breeding rooms (Nos. 118, 119) for mammals, the latter with outside wire-enclosed runs; there is another wire enclosure south of the vivarium; the hallway leading to the mammal rooms is closed off from the main south corridor by a special door so as to exclude odors. This mammal wing is raised well above the ground level so as to insure dryness, and is well ventilated.

The large room (No. 105) at the southeast corner of the south wing, immediately adjoin- the mammal wing, is also designed for breeding purposes, particularly for insects, and so is room No. 109 on the same floor. In the basement is a room (No. 20) on the north side for the incubation of hens' eggs. On the third floor are three large rooms (Nos. 305, 306, 311) in the south wing for the future extension of breeding facilities. All these various breeding rooms have drained cement floors. On the east side is a ground area enclosed on three sides by the walls of the building, and it is planned to screen this off for outdoor breeding.

There are four constant temperature rooms. Room No. 15 of the basement is for the cold storage of anatomical material, to be kept at a temperature ranging from 28° to 32° F. Separated from it by a partition is room No. 15A, which measures 5×12 feet, and is for cold constant temperature of from 14° to 32° F. Room No. 16 is for the cooling machinery and room No. 14 for the large brine tank. On the second floor is room No. 204 for constant body temperature, to be heated by the radiation from a gas stove. Room No. 304, on the third floor, is designed to be set constant at any temperature between 32° and 98° F.; it allows the admission of sunlight through the roof, the light passing through a basin of running water. All rooms and anterooms are thoroughly insulated with nonpareil corkboard and provided with Stevenson refrigerator doors. It is designed in each room to keep

the temperature constant within ½° F. of the point selected. The refrigeration is kept independent of the ventilation; the air for ventilation is cooled in the anterooms to the temperature of the rooms to which it is to be admitted. This matter of ventilation is one of the most difficult, but absolutely necessary when it is intended to keep living animals for long periods. The refrigeration is by the circulation of brine in coils, automatically controlled by thermostats. For the cooling of the brine there are two ammonia-compressors of the vertical single-acting type; one is large enough to operate the entire plant under all conditions; the second with a capacity of half of that of the first. Within constant-temperature rooms where living animals are to be kept there are no ammonia pipes, so that there can be no leakage of ammonia in the rooms.

The direct steam heating is from a central power station, as is also the electric power. All lighting is by electricity. In the basement is the plant (Nos. 17, 18, 19) for ventilation by filtered air, and this is subdivided into systems so that different parts of the building may be ventilated independently of each other. All ventilation conduits are placed within the walls lining the corridors. Steam, gas and water pipes are all exposed, and so are the rain conductors which are inside the building. The sinks, which are in nearly every room of the building, are of soapstone with an ash drain board at one end; most of the sinks measure one and a half by two feet, but certain special sinks for anatomy are much larger; one of the latter is 3 feet deep and 8 feet long. Each bibb has an extra small cock for the attachment of rubber tubing. Bunsen burners are attached to gas outlets by flexible wire tubing.

All tables have birch tops, ebonized. All wall cases are of oak with glass doors, and all the furniture is master-keyed. Drawers and trays of all standard wall cases are interchangeable. The general type of wall case is four feet wide; the upper part is provided with glass doors and shelves, the lower, deeper part with wooden doors and shallow drawers. The usual type of preparation table has a top measuring $1\frac{3}{4} \times 5$ feet, and is of a convenient size to move. Beneath the built-in window tables there are no drawers, so that one may work at any part of them. All chemical hoods have wooden frames in order that the glass may be readily replaced when broken.

The office room (No. 102) is on the first floor between these two entrances that are most used; it is occupied by the stenographer, who also acts as telephone central and keeps student records. There is an intercommunicating telephone system with twelve stations, at any of which a person may call up any station independently of the telephone central. A room (No. 103) for the janitor is placed near the main entrance. For freight there is a room (No. 8) in the basement and also a large space (No. 10A) beneath the seats of the auditorium.

For the use of the men students are two locker rooms in the basement, with vertical lockers of expanded metal, adjoining which is a large lavatory (No. 2) and a smoking room (No. 4). There is a separate toilet for janitors (No. 7). For women is provided a locker and sitting room (No. 108) on the first floor, with lavatory (No. 107) contiguous. On the second and third floors are other toilet rooms (Nos. 211, 310), that of the second floor provided with a bath for the convenience of any investigator who chooses to reside in the building.

The whole building has been made as elastic as possible so as to provide for future needs. Partitions between rooms are of terra cotta and may be easily removed; it will prove cheaper to tear down partitions so as to make larger rooms when necessary than to have large rooms at the start and later erect partitions in them.

Thomas H. Montgomery, Jr.
University of Pennsylvania

THE CHEMIST AS A CONSERVATIONIST

It is remarkable, if one has not given the matter serious consideration, to what extent the chemist is interested and concerned in the conservation movement, that has recently been agitated in this country. This was especially